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1651/388

DIRECTIONS

For managing the

IRON-PLOW,

AND

VENTILATOR

(Or FANNERS,)

Made at ROBERT BULL's new
Smith and Wright-work Manufactory,
Foot of Leith-walk.

13. 4. 10.

To all Gentlemen, Farmers, &c.

THAT the instruments of husbandry, when properly constructed and managed, are of the greatest value to a country, is beyond controversy; and I hope those made at my factory, if the following directions with respect to these subjoined, are observed, will at length prevail

1758?

prevail over that unaccountable sloth and obstinacy, which, where particular interests are not concerned, seem to possess the generality of our lower class of mankind, and which rarely allows them to give due attention to any new machine, however useful, if it puts them out of their ordinary course. This proves one of the greatest bars to our improvements in the instruments of husbandry; these persons being wholly averse to every thing that is not in their usual channel, new discoveries being laughed at, and, in many cases, masters cannot prevail with their servants to make trial of any new machine, however obvious the improvement may be to men of genius and understanding.

That nothing may be wanting on my part, I have ordered the following directions to be printed for the managing of the *Iron-plow* and *Fanners* made at my factory; which, if carefully observed, will, I hope, not only make these give satisfaction to my employers, but also



also diffuse them and the other instruments of husbandry more through the remote parts of this country, where improvements are yet in their infancy.

DIRECTIONS for the Management of the IRON-PLOW

THIS plow being constructed in a different way from any iron-plow that I have seen, can easily be adjusted in the following manner:

On the point of the beam is a muzzle, contrived for giving and taking land and yerd, in the fore-part of which there are five holes, lying horizontal, and a small muzzle fixed with a bolt into the middle hole, standing perpendicular, which serves to take in a ring fixed in the middle of the swingle or horse-tree.

In case the plow hath not enough of land, move the small muzzle into another hole nearer the furrow or right hand of the plowman, which will make the horses pull from a point nearer the furrow,
and

and consequently make the point of the sock and coulter tend more towards the land. If the plow hath too much land, moving that small muzzle into the holes nearer the land, or left-hand side of the plowman, will make the point of the sock and coulter tend more to the furrow; and altho' it will appear very trifling, the variation that such an acute angle will make, yet it will easily be felt by the plowman, if the plow is otherwise properly constructed for the soil that she is to be wrought in.

If the variation which these holes will make, do not fully adjust the plow as to the land, take a few coals, peats, or pieces of wood, and make a fire, upon which lay the beam, at the curved or bended place, before the thirle hole (called the redd of the beam) which bring to a blea heat, then set the plow upon her soal, and if she hath too much land, hold a hammer or stone upon the land-side of the beam, where it is hot, and take the point of the beam a blow with a hammer upon the furr-side, which will

will set the point of the beam more towards the land, by which, the cattle being fixed to a point nearer the land than before this alteration, will pull the point of the sock and coulter more from the land ; and the reverse method is to be taken if the plow hath too little land.

If the Plow hath too little yerd, (which rarely will be the fault of my Iron-plows, as the verge or lower part of the roller or wheel, acting upon a pevet half an inch diameter, is prominent) take out the small bolt that is fixed in the beam through the two middle holes, there being five in the tails or hind end of the muzzle, which stand perpendicular, and put the bolt through the holes above, by which means you'll find the fore part of the muzzle elevated or heightened, so that the cattle pulling from a higher point, pull the point of the sock and coulter more into the ground ; and the reverse method of altering the muzzle is to be taken, if the plow hath too much yerd.

If the variations that these holes
make

make are not sufficient for adjusting the plow as to the yerd, heat the beam as before directed; and, if the plow hath too much yerd, hold a hammer upon the hot place of the beam below, and give the point of the beam a blow downward, by which the point of the beam will be nearer the ground; and of consequence, the cattle pulling from a lower point, will prevent the point of the sock from running deeper into the ground than the plowman inclines.

A skilful plowman may check this, in a great measure, by adjusting properly his horse-greath, as they term it. For example, if the plow hath too much yerd, he must float his sock a little more, shorten his theats or horse-traces, and bring the back-band further behind upon the horse back. Such alterations as these will be found all that is necessary, except when the plow is at work in tough, swardie or clay ground; in this case it will be requisite to make a variation in the beam as before, as such ground requires from two to three inch-

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es less yerd, from the beam point, than any ordinary mouldy ground.

I could wish to see it the universal practice, that horses were yoked to go all on-end in the furrow, and fixed to one swingle-tree, as described in my copperplate, by which the power being united in one streight line, terminates in one point; and by this method the cattle are enabled to exert their whole force, without any part of that force's being employed in their wrangling against one another, which often happens when horses are yoked a-breast, or when the fore-horse is fixed at the beams of the one behind. By this erroneous method of yoking, part of the power of the hind-horse is employed in resisting the force of the one before him, who will be quite cool, when the horse next the plow is all in a lather; whereas, when they are both fixed to one swingle-tree at the beam-point, each have their own pull or force acting in a streight line upon, and immediately affecting the plow. By this method

method of yoking, it will be found in practice, that two horses will have a greater effect upon the plow, than three horses, when the two before the one next the plow are fixed at the heams of each other.

All my iron and wooden-plows are constructed for horses going in the furrow, unless my employers order them to be made for horses going a-breast; therefore, if they are to be wrought with horses about fourteen and a half, or fifteen hands high, I give them seven inches of land from the beam-point, and seventeen inches of yerd. That I may be understood in this, after the plow is finished, she is set upon her soal on a level board, or level piece of ground, then hang a plummet over the point of the beam in the middle, and measure from a line or streight edge applied to the land-side of the head to that of the plumb-line, which ought to be seven inches; but if the plow is designed for horses going a-breast, there should be only four and a half inches distance.

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What other alteration may be found necessary for the various soils, the muzzle will give, as to the land.

For ascertaining the yerd from the beam point, you measure from the bolt-hole or axis of the muzzle to the board or base of the plow, which ought to be seventeen inches for horses of the above size ; but if this plow is designed to be wrought with oxen, there must be from one to three inches greater distance, according to the size of the oxen commonly used about the Lothians. The muzzle will adjust what else will be found necessary as to the yerd, unless the plow is going in strong clay-ground ; in this case the alteration in the beam, as before directed, will be necessary.

As in some cases the expansion or contraction of the mould-plate behind may be found necessary in particular soils and for certain purposes, such as for horse hoeing when the plow should go at a proper distance from the roots of the grain when sown in drills, and

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the earth be laid clos up to the roots, heating the hind-end of the mould-plate, and laying it upon an anvil or stone immediately below the lower end of the little or furr-stilt, when the plate may be beat out and expanded upon the upper side so as to lay the furr quite upon its back, or by beating in the plate so as to contract the mould-plate a little, will set the furr streight upon edge.

I would advise, that my Iron-plows, or my other plows with the cast metal mould plate, should be wrought at first into light sharp ground, which will scour these plows so as to require less power to work them in stiff ground.

These plows, which I now make, ought to go fair upon the soal without being set upon the land edge of the head, (a common practice of holding plows in this country); for if the plow is properly adjusted for the soil, she should do the work without any labour to the holder; but if she is held as the Lothian plow for ordinary is, the land
from



(II)

from the beam-point is taken in a great measure away.

If furniture for two horses going on end in the furrow is ordered, with every Iron-plow that I make from and after the 1st of May 1758, which adds but a small expence to the plow, as that furniture can be used for carts, harrows, &c. I shall be to blame if she doth not answer the sanguine expectations of my employers, if the rules contained in these directions are properly observ'd.

It occurs to me that in the use of the Iron-plow, a sudden shock against a yerd-fast stone, may unbend or streighten the beam a little, though I have not heard of any such accident happening to any that I have made. Should it happen, heating the beam, as before directed, and giving the point of the beam a blow downwards, will reduce it to its former curve; nor can any force bend it that will not break the beam of a good wooden plow.

I would advise any who are pleased to favour me with their orders for the

Iron-plow, to take two or more socks with each plow, adapted for different soils (each of which add only about one shilling and sixpence to the expence of the plow) because when the plow is to be wrought in ground pretty free of stones, the broad feathered sock is proper, as it cuts the furrow all the breadth; but when the plow is to go in stony ground, the small or narrow feathered sock must be put on, which will be found all the alteration necessary for these different soils, the plow being otherwise adjusted, as before directed.

My employers will please observe that all the iron plows which I have sold before Number 163, at four-pence half-penny the pound, altho' constructed upon the same principles, are not bound so strongly as those made since that number, for which I take fourpence three farthings the pound; that additional farthing being fully bestowed upon the workmanship, much for the interest of the purchaser.

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By the improvement I have now made upon this plow, all the parts most exposed, by friction, to be wore, can be repaired by any common smith, so that, in all probability, it should last 15 or 20 years.

If any other difficulty occur in practice, through want of skill in the management of the plow, or otherwise, upon dropping me a line, I shall, in course of post, offer what throws up to me for removing any objection, or rectifying what may be found amiss.

And as there are as certain rules for making a plow properly, when the soil, species of cattle, and their size are known, as for making any other piece of work, I shall give proper directions for constructing that instrument, in my *Treatise on the instruments of husbandry*, which I intend to publish.

DIRECTIONS

DIRECTIONS for Managing the
VENTILATOR or **FANNERS**,
 for dressing and cleaning Corn or
 Lintseed.

BEfore this Ventilator is set to work, care must be taken to oil all the pevets; and, so often as they require it, which is done with sweet oil at a trifling expence, *viz.* three in the axis going thorough the axletree into which the fanner-leaves are fixed, and two in the axis of the iron wheel: All these pevets act in brass bushes, which have small holes in the sides, that are placed opposite to the small holes made into the wooden standards, into which you convey a little oil by a small funnel or tobacco pipe, which the hole in the brass bush takes in by degrees, the teeth of the iron wheel acting upon a brass pinnion, as also the socket of the crank which moves the shaking board or riddle ought to be oiled, which not only makes the machine go easy, but prevents the pevets, bushes, &c. from wearing soon.

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To serve these fanners properly, so as to make them chaff and clean easily above fifty bolls in ten hours, will require four men, one to work them, one to fill the hopper, and two to riddle and take away the clean corn. Able girls may do in their place, in case men cannot be spared.

When the corn is to be chaffed, for it must be twice put through the fanners, the scree or harp, (of five feet long, and fifteen three fourth inches broad, which hath two falls) is taken out, and the board below, that folds down when the scree is in, is put up and secured by a sneck ; then the whole grain with the chaff is put into the hopper, the shaking-board being lowered according to the roughness of the grain, when the wind will separate the chaff and part the light corn from the hearty grain and seeds.

After the chaff is thus separate from the grain, the scree is put into the fanners, the board below the scree being let down, and the shaking-board moved a little higher, the whole hearty corn and

and seeds are put into the hopper again. In case you want the whole light corn to be effectually separate, the sliding-board is put down, and by moving the machine quickly, nothing but the hearty part of the grain and seeds will run down the scree (which stands at an angle of 45 degrees) the seeds unless very large, will go thro', and the plump grain run to the ground.

The above directions are proper, when wheat, barley, or oats are to be dressed, but when you are to clean peas, or beans, you tack an woollen cloth upon the middle or dividing board, which prevents any of the hearty grain from bounding away amongst the chaff, or weaker parts.

When gentlemen desire it, I make a scree or harp adapted for cleaning lintseed; the machine being wrought in the manner as above directed, only drove slower, in proportion to the quality of the lintseed, the only alteration necessary in the management, is of the scree.

The machinery of the fanners can be turned either way, without doing any

any prejudice, but it is an easy matter to discover the right way, as it throws out a much greater quantity of wind; and if due care be taken in oiling the pevets, and keeping this machine clean it should laste a life-time.

The advantages that have arisen to the Tenant, Master, and Merchant, from this instrument have been sensibly felt by those who use it: The tenant in time, with due care, gets quit of many annual seeds; the master gets his corn-rent paid with well dight grain, nor can the tenant qualify any loss thereby, as what is taken out can be used by his cattle, and it is found, that he saves much more in the expence of time, and that of the risque of victual heating, and growing when it lyes long in damp barns amongst the chaff, than all that he could gain by delivering his light stuff amongst the good. And the merchant by getting good clean corn, is enabled to pay his money to the master without any scruple.

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Were it not thought a digression, I would advise that there should be a clause in all tacks where victual-rents are paid, that farmers should deliver the corn fanner proof, (then due care would be taken to have these good) the master could then sell it with that condition to the merchant, who would be enabled to give two and a half per cent more, than when the delivery is to be in corn dight in the usual way, without fanners.

No person who keeps stocks of grain upon hand, ought to want fanners, as by these they can keep their corn quite free from mites, dust and heating, at a trifling expence, as four men can put betwixt two and three hundred bolls in one day thorough them, which has been done in Leith before shipping; nor should brewers, or distillers be without them, as they can thereby get quit of the poor thin grain, which will not malt, and yet when steep'd, swells to greater bulk than the good, yields nothing, but rather imbibes part of the substance
of

of the good grain, and encreases the malt duty. *following*

The ~~above~~ articles, particularly what relate to the Instruments of Husbandry, are what I design to treat upon; but, as these will take many plates, that their constructions may be the better understood, the work will not be so quickly done as I intended.

Follows articles of WRIGHT WORK, amongst many others not mentioned, that are executed at said Factory.

AXle-trees for carts, &c. made of seasoned ash or elm. Balance beams of wood for any weight under 2 tons. Wheel barrows made of oak and ash for gardens, No. 1, 2, and 3. Two wheel'd coup-barrows for emptying expeditiously, with which are often taken hay bodies, which fits the same axle and wheels, by which a man can carry about 30 stones of grass, &c. upon any level ground, that the wheels will not dip in. Two wheel'd carriages,

riages, by which a man can carry a hogsheaf of water on such ground for watering gardens. Drill ~~barrows~~ for sowing seed after the plow. Barrows with two or three steels, for two, or eight men, carrying large stones, &c. Box and knife for cutting straw for cattle. Bellows for smiths, small or large. Dy-sters and tobacco presses. Three wheel'd carts proper for levelling ground, or Open carts, No. 1, 2, and 3. Closs carts, No. 1, 2, and 3. Coup carts, No. 1, 2, 3, and 4. Carriages for transporting trees erect of any age under sixty years, raised by a winless fixed upon the carriage, which carries the trees suspended, with a quantity of earth, to the pits they are to be set in. By this machine, (if the timber is contiguous) an avenue of full grown timber may be compleat in one season, with little risk of one tree failing, proper care being taken to water and stay the trees with spurs. Cart horse saddles. Scots or English kind. Callanders or Mangles. Fanners for dressing grain. No. 1, 2, and

and 3. Hay tops for putting upon carts, to carry from 50 to 100 stones hay or corn. No. 1, 2, 3, and 4, made with screws, in place of clink bolts as formerly, that they may be taken to pieces and pack in little room for transporting in vessels, at an easy freight. Cart and plow horse furniture, viz. bridles, back bands, belly bands, long crupers, brichings and crupers, made of best neat leather, and sold by the pound. Also brachams or neck collars of sundry kinds. Heam blades, mounted for the sundry kinds of brachams, with iron or tuggæ leathers. Harrows teethed with plain or coulter teeth with cotrills, for common break, or levelling harrows, No. 1, 2, and 3, of each kind. Harps for dressing grain, which supplies, in a small part, the fanner. Harps for harping sand proper for lime, or garden-walks. Paddock or low strong carriages for carrying several tons of stones, &c. Pipes for covering traces. Plows called breast-plows, with which a man works in soft ground where cattle cannot go. Plows, com-
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mon Lothian kind, made of choice dry ash and oak. Ditto with roderham mould-board. Ditto with cast metal mould-plate, roderham form, Roderham plows. Drill plows for sowing various seeds. Horse hoeing plows. Two, three and four coulter'd plows. Double headed plows. Shifting mould-plate plows, much used for levelling and plowing upon hilly ground. Trenching plows. Water furring plows. Rollers for grass or corn, No. 1, 2, and 3. Rollers adapted for dibbling regularly any kind of grain. At the distance required, by this machine, with one man and one horse, four acres can be dibbled in one day, children being employed to drop the grain. Streachers for preventing the sides of horses being shaved by their traces. Waggon with four wheels of the several kinds used in England. Wheels for coaches, chaises, waggons, carts and paddocks. Gun and all other carriages. Yokes for oxen, double or single, with bows of wood, or iron embosses for oxen drawing a-breast or in the team.

Follows

Follows a specimen of articles of SMITH WORK, amongst many others that are execute at Robert Bull's Factory, Foot of Leith Walk.

ANvills for smiths, with or without horn and holl. Ditto well repair'd. Anchors for ships, any weight under 10 Ct. Axles of iron for coaches, chaises, waggons or carts, with or without being cranked. Ballance beams, of 20 lb. weight and above, with steel pevets, or hooks and eyes. Boring rods, for finding any metal, with all their pendicles. Back-bands (called rig-wodies) plain links or twisted. Cranks for engines, single, of any square under six inches. Double cranks, each for working two pumps. Chains of any size or length. All the iron work for lead or coal engines. Drags for coaches or carts. Grapnels for boats or wells. Horse shoes by the stone. *Jamaica, Carolina, Virginia, Barbadoes* or garden-hoes of all sizes. Iron plows with rollers. Large
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or small hammers for quarries, Smiths, or masons. Napping hammers for breaking stones, all well steeled. Knives for cutting straw which makes three cuts at one operation. Kitchen grates or ranges. Jimpers or jumpers, with all the other pendicles for boring stones to be blown with powder. Leavers or pinches of any size or length for raising great stones. Leavers suspended by chains hung at triangles, which can be calculated to lift stones, &c. of any size or weight under ten ton. Plow-soams for oxen or horses. Picks, Pick and hoe, or ax and hoe. Ship work of all kinds. Still-yards small or large. Spades for gardens, No 1, 2, 3. Draining spades, the set. Draining shovels, the set. Common square-mouth'd shovels No 1, 2, 3. Oval-mouth'd shovels No 1, 2, 3. Traces for carts or plows. Screwed bolts of all sizes. Cut-screws and iron boxes for tobacco or dysters presses. Vices for smiths, of all sizes. Wedges for quarries, lime or free-stone. Shoes and nails for coach, chaise, waggon or cart

cart wheels, exactly calculated for the diameter of the wheels for which these are ordered.

P O S T S C R I P T.

Altho' I have employed at present in my factory, twenty-two tradesmen (and more good hands wanted) viz. smiths, wrights, horse-furniture makers, and sawers, (besides several smiths often employed without the factory) who execute a deal of work, materials for the common run of country utensils being at all times ready prepared, of seasoned wood; yet, as it often happens, that orders do not come till they are instantly wanted, it is beg'd that orders may be given in due time, before they are to be called for, which will not only be obliging, but will enable me to get the work execute without any hurry, more to my mind, and also to the satisfaction of my employers; and as there is not one wright kept on piece-work at *this Factory*, I thereby, when not hurried,

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can get my work well done, in which my interest is more connected than that of my employers.

N. B. As some ill designing persons have alledged, that unless more iron was charged upon my wheels than is really furnished, I could not afford wrought iron at the price I sell it at, iron being now so dear; I assure them I can, having with my management (and perhaps buying iron in quantities lower than the retail price) about five per cent profit, which from my consumpt and ready money is all I want; And altho' these malicious reports can have no weight with men of sense, yet, to prevent their having any effect upon the lower credulous class of mankind, I hereby become bound to pay fifty pounds sterling, to any person (my own servants not excepted) who can make appear, that I ever have stated, or shall state a pound of iron more upon wheels, plows, &c. than is really furnished, and paid for, to my smiths.

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As I am fond to encourage this laudable spirit of improvement, now embraced by gentlemen of all ranks, they may depend, nothing in my power shall be wanting to forward the same effectually : therefore, as many gentlemen, who bend their thoughts towards improving their land, are enquiring at me for proper servants to assist in that valuable branch, such servants throwing up often to me, I take a note of their names, places of residence, and recommendations ; gentlemen may therefore please write me some time before they want such ; when I shall advise what servants on my note-book are unprovided, with their recommendations and character, agreeable to my information : and, as I propose to take this trouble without any reward, more than the gentlemen's favour, it is hoped such letters will be sent me free of postage. Gardeners qualified to assist in small farms, may also give in their notes to me.

All such servants, wanting masters, may call at me, or send me proper directions

regions where they are to be found, with a note of the places they have been in, and characters they have obtained from their masters, and that I may not be misled in the characters of these servants that apply to me, it is hoped that gentlemen will only give such as they justly merit.

N. B. Ash, Elm, or Oak, proper for spokes, lying contiguous for transporting by water to Leith, will, upon receiving information of the size, quantity and quality, be bargained for, *without trifling*, either where it lies, or upon delivery at Leith. As a considerable quantity of the above kinds will be needed annually, to make these instruments of service to the country, to the extent of betwixt two and three hundred pounds Sterling, it is hoped that gentlemen who have quantities of such wood, ~~will~~ will acquaint me.

It is a pity that planting of Scots Ash and Elm should be so much neglected by gentlemen in this country, (they being much superior to English in quality), whose lands ly near a river, which can float such timber to any place where it can be shipped: One hundred thousand such trees, so situated and properly planted at twelve feet distance, would, in fifty years, fetch at least 25,000 l. Sterling, which, in many parts of our country, would employ but a small space of an estate, perhaps not worth 50 l. *per annum*. I have seen many fields almost barren, particularly in the North, lying contiguous to fine rivers, and the soil kindly for raising such timber.



F I N I S

13. 4. 10.

Any thing new if occurs to me I
shall publish in *Edinb. weekly Journ*